

Hormone Replacement Therapy and Its Impact on Periodontal Health

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Abstract

Background: Hormonal fluctuations throughout a woman’s life influence periodontal health, with estrogen deficiency during menopause posing a particular risk for periodontal breakdown. Postmenopausal women commonly experience systemic changes such as osteoporosis, which may further contribute to alveolar bone loss.

Aim: This review explores the impact of hormone replacement therapy (HRT) on periodontal health in postmenopausal women, examining biological mechanisms and current evidence regarding its benefits and limitations.

Summary: Estrogen plays a vital role in regulating bone metabolism, inflammatory responses, and connective tissue turnover within the periodontium. Declining estrogen levels during menopause have been associated with increased osteoclastic activity, reduced bone density, and heightened periodontal inflammation. Several clinical studies indicate that HRT may help preserve alveolar bone, reduce gingival bleeding, and improve periodontal parameters. However, findings remain inconsistent, with some studies reporting limited or no improvement in clinical attachment levels or probing depth. Variations in study design, hormone formulations, treatment duration, and patient-related

factors contribute to these discrepancies. While HRT offers systemic benefits and may indirectly support periodontal health, it should not be used solely for periodontal treatment.

Conclusion: HRT may play a supportive role in maintaining periodontal stability in postmenopausal women, but current evidence is inconclusive. Further well-designed longitudinal studies are required to clarify the extent of HRT's periodontal benefits. A collaborative, individualized approach to care is essential to optimize both systemic and oral health outcomes.

Keywords: Hormone Replacement, Therapy Menopause, Estrogen Deficiency, Periodontal Disease, Osteoporosis, Bone Mineral Density.

Introduction

Hormones are regulatory molecules that govern essential biological processes, including reproduction, growth, development, maintenance of internal homeostasis, and energy metabolism. Their influence extends to nearly all body tissues, reflecting both physiological and pathological changes. Receptors for several hormones, such as estrogen, progesterone, and androgens, have been identified in periodontal tissues, indicating that disturbances in endocrine function can significantly affect periodontal health and disease progression.^[1] Hormonal fluctuations during puberty, pregnancy, and menopause can markedly influence the periodontal condition of women.^[2-4] Natural menopause is defined as the permanent cessation of menstruation for 12 consecutive months without any underlying pathology, whereas postmenopause refers to the stage following the final menstrual cycle, whether it occurs naturally or is medically induced.^[5] Postmenopausal women exhibit a higher prevalence of periodontitis, a chronic inflammatory disease that compromises the tooth-

supporting structures, leading to tooth loss and impaired oral function.^{6,7}

Over the past decade, hormone replacement therapy (HRT) has been recognized as an effective strategy for managing menopausal symptoms.⁸⁻¹¹ This therapy helps reduce bone loss, thereby playing a vital role in both the prevention and management of postmenopausal osteoporosis.¹²⁻¹⁴ Furthermore, evidence indicates that HRT may have a positive influence on periodontal health in postmenopausal women.^{15,16} However, existing studies on the association between HRT and periodontitis have reported mixed results. While some suggest that HRT lowers the risk of periodontal disease, others find no significant relationship, likely due to variations in study design, sample size, and control of confounding factors. Additionally, many earlier studies did not evaluate important secondary outcomes such as clinical attachment loss (CAL) and salivary flow rate.¹⁷ Therefore, a comprehensive review is warranted, as despite several investigations, the evidence remains inconclusive regarding the exact influence of HRT on periodontal status.

Hormonal Influence On The Periodontium

During puberty, the anterior pituitary gland starts releasing gonadotropins—follicle-stimulating hormone (FSH) and luteinizing hormone (LH)—which stimulate the ovaries to initiate the cyclical production and secretion of the primary female sex hormones, estrogen and progesterone.^[18] Throughout a woman's life, from prepuberty through puberty to the postmenopausal stage, fluctuations in hormonal levels bring about continuous physiological changes that alter the body's internal environment, often manifesting with distinct effects on oral health.¹⁹

Puberty: Puberty is characterized by elevated levels of estrogen and progesterone, which can promote the

proliferation of periodontal bacteria. As a result, individuals in the pubertal age group tend to exhibit a higher prevalence of periodontitis compared to those in the prepubertal stage.²⁰

Menstruation: Many women experience increased gingival inflammation and discomfort in relation to their menstrual cycle. Studies have shown that gingival inflammation tends to be less pronounced during menstruation compared to the ovulatory and premenstrual phases. This variation is largely attributed to fluctuations in serum estradiol, a natural form of estrogen that rises and falls during ovulation and the premenstrual period. Additionally, during the luteal phase of the cycle, progesterone levels peak, contributing to heightened inflammatory responses in the gingival and periodontal tissues. These hormonal effects are most evident at the onset of the cycle and gradually diminish over time.²⁰

Pregnancy: An exaggerated gingival inflammatory response to dental plaque is the main cause of pregnancy-associated gingivitis, which typically begins around the second month of pregnancy and generally subsides after childbirth. Pregnancy may also contribute to the progression of periodontitis, leading to deeper periodontal pockets and alveolar bone loss around teeth. Furthermore, evidence suggests a possible association between maternal periodontitis and adverse pregnancy outcomes, such as preterm birth and low birth weight infants.²⁰

Menopause: Menopause is the natural cessation of menstruation, typically occurring between 45 and 55 years of age, and signifies the end of a woman's reproductive phase. The decline in ovarian function during this period produces changes in the oral cavity that differ markedly from those seen during pregnancy. Although oral alterations are not universal in

menopause, some women experience conditions such as **menopausal gingivostomatitis**, characterized by dry, shiny oral mucosa and gingiva that may appear unusually pale or erythematous, with an increased tendency to bleed.

One of the most significant systemic changes during menopause is an increased predisposition to osteoporosis. The reduction in estrogen levels adversely affects collagen metabolism and bone homeostasis. Approximately one-third of women over 60 years of age are affected by postmenopausal osteoporosis, which is associated with decreased bone mass, density, and strength, predisposing them to fractures. As a result, postmenopausal women may also be more vulnerable to periodontal disease; however, the relationship between osteoporosis and periodontitis remains a subject of ongoing debate.²¹

Hormone Replacement Therapy (HRT)

Hormone replacement therapy (HRT) restores ovarian hormones that decline during the natural menopausal transition to relieve symptoms such as hot flashes and night sweats. Conventional HRT generally combines estrogen and progesterone to replicate the effects of natural ovarian hormones. Approved by the U.S. Food and Drug Administration (FDA), HRT is used to manage severe vasomotor symptoms and to prevent postmenopausal osteoporosis. Common forms of estrogen therapy include ethinyl estradiol, conjugated equine estrogen (CEE), synthetic conjugated estrogens, and micronized 17 β -estradiol. The addition of progesterone is recommended for women with an intact uterus to prevent endometrial hyperplasia. Systemic HRT may be administered orally, vaginally, or transdermally, with each route offering specific advantages and risks. The goal of HRT management is to ensure an individualized, evidence-based approach

that balances therapeutic benefits against potential risks through appropriate selection, dosing, and interprofessional coordination of care to optimize patient outcomes.²²

Mechanism of action: Estrogen-based hormone replacement therapy (HRT) is believed to influence the hypothalamus by modulating the neurokinin B signaling pathway, which plays a crucial role in reproductive and thermoregulatory control. This pathway interacts with the median preoptic nucleus, responsible for maintaining body temperature. Through this modulation, estrogen therapy helps reduce vasomotor symptoms such that are common during menopause.²³

Hormone Replacement Therapy and The Periodontium

Over the past decade, hormone replacement therapy (HRT) has been established as an effective approach for alleviating menopausal symptoms. This therapy helps slow down bone loss and plays a vital role in both the prevention and management of postmenopausal osteoporosis. Additionally, several studies have proposed that HRT may positively influence periodontal health in postmenopausal women. Clinical investigations have reported beneficial effects of HRT on alveolar bone density and tooth preservation. However, only a limited number of studies have examined the impact of HRT on periodontal health in postmenopausal women. Some findings suggest that women undergoing HRT exhibit reduced gingival bleeding compared to estrogen-deficient counterparts, though conflicting evidence exists regarding its effects on clinical attachment levels and probing pocket depth.²⁴

Since estrogen deficiency is a major risk factor for osteoporosis, its role in the connection between osteoporosis and periodontal disease warrants consideration. Longitudinal research on small groups of

postmenopausal women has shown that estrogen deficiency leads to a notable reduction in interproximal bone density. Conversely, hormone replacement therapy (HRT) has been found to increase bone density in the crestal and subcrestal regions of the alveolar bone. However, it remains uncertain whether these mineralization improvements translate into gains in periodontal attachment. While some studies report that HRT is associated with reduced alveolar bone loss,^[25] others have not found a clear inverse relationship between alveolar bone density and the severity of periodontal disease.^[26,27] Additionally, certain investigations have failed to demonstrate any significant advantage of HRT in preserving alveolar bone density or height.^[28,29] Significant alveolar ridge resorption has been observed in edentulous patients with osteoporosis, and the reduction in ridge height is often linked to both osteoporosis and osteopenia.^[30] However, tooth loss is not a reliable indicator of periodontal disease since it can also result from dental caries or trauma.

Hormone replacement therapy (HRT) serves as an effective option for the prevention and management of systemic conditions in postmenopausal women; nonetheless, its purpose, dosage, and treatment regimen should be carefully tailored to each individual.^[31]

Discussion

The relationship between hormonal changes and periodontal health is multifactorial, with estrogen playing a pivotal role in maintaining bone metabolism, inflammatory regulation, and connective tissue integrity. During menopause, declining estrogen levels contribute to increased osteoclastic activity and connective tissue breakdown, which may accelerate alveolar bone loss and predispose women to periodontal disease.

Hormone replacement therapy (HRT) aims to restore estrogen levels, potentially mitigating these adverse

effects. Several studies suggest that women receiving HRT demonstrate improved periodontal parameters, such as reduced gingival bleeding, lower plaque accumulation, and better alveolar bone preservation. These outcomes are attributed to estrogen's ability to enhance bone mineral density and down-regulate inflammatory mediators involved in periodontal destruction.

Despite these potential benefits, the evidence remains inconsistent. Some investigations report minimal or no improvement in clinical attachment levels or probing pocket depth among HRT users. Such discrepancies may be due to variations in study design, hormone formulations, treatment duration, and unaccounted lifestyle factors, including smoking and oral hygiene practices. Moreover, many existing studies are cross-sectional, limiting the ability to infer causal relationships.

Experimental data from animal studies indicate that estrogen deficiency leads to increased alveolar bone resorption, while estrogen supplementation can help preserve bone mass. However, translating these findings to human populations remains challenging. The route of administration—oral, transdermal, or vaginal—may also influence HRT's systemic and local effects on periodontal tissues.

From a clinical standpoint, while HRT should not be prescribed solely to improve periodontal health, its systemic benefits may indirectly support oral health maintenance in postmenopausal women. Collaborative management between dental professionals and physicians can optimize both systemic and periodontal outcomes. Regular periodontal assessment, patient education, and risk factor control are essential for this group.

Future research should focus on long-term, controlled studies to clarify the extent of HRT's influence on the periodontium and to identify which therapeutic protocols provide the most benefit. Understanding the biological mechanisms that link estrogen regulation with periodontal response could further improve preventive and therapeutic strategies for postmenopausal women.

Conclusion

Hormonal changes, particularly estrogen deficiency during menopause, can negatively affect periodontal health. Hormone replacement therapy (HRT) helps counter bone loss and may contribute to improved periodontal stability. However, current evidence remains inconsistent due to variations in study design and treatment protocols. HRT should not be prescribed solely for periodontal benefits, but its systemic advantages may indirectly support oral health. Further well-designed studies are needed to clarify its exact role. Integrating hormonal considerations into periodontal care may enhance overall management strategies for postmenopausal women.

Reference

1. Mascarenhas P, Gapski R, Al-Shammari K, Wang HL. Influence of sex hormones on the periodontium. *Journal of clinical periodontology*. 2003 Aug;30(8):671-81.
2. Patil SN, Kalburgi NB, Koregol AC, Warad SB, Patil S, Ugale MS. Female sex hormones and periodontal health-awareness among gynecologists—A questionnaire survey. *The Saudi dental journal*. 2012 Apr 1;24(2):99-104.
3. Soory M. Hormonal factors in periodontal disease. *Dental update*. 2000 Oct 2;27(8):380-3.
4. Markou E, Eleana B, Lazaros T, Antonios K. The influence of sex steroid hormones on gingiva of

- women. *The open dentistry journal*. 2009 Jun 5;3:114.
5. Meeta M, Digumarti L, Agarwal N, Vaze N, Shah R, Malik S. Clinical practice guidelines on menopause:* An executive summary and recommendations: Indian Menopause Society 2019–2020. *Journal of Mid-life Health*. 2020 Apr 1;11(2):55-95.
 6. Tadjoeidin FM, Fitri AH, Kuswandani SO, Sulijaya B, Soeroso Y. The correlation between age and periodontal diseases. *Journal of International Dental and Medical Research*. 2017 May 1;10(2):327.
 7. Rukmini JN, Sachan R, Sibi N, Meghana A, Malar CI. Effect of menopause on saliva and dental health. *Journal of International Society of Preventive and Community Dentistry*. 2018 Nov 1;8(6):529-33.
 8. Caufriez A. Hormonal replacement therapy (HRT) in postmenopause: a reappraisal. In *Annales d'endocrinologie* 2007 Sep 1 (Vol. 68, No. 4, pp. 241-250). Elsevier Masson.
 9. Harman SM. Estrogen replacement in menopausal women: recent and current prospective studies, the WHI and the KEEPS. *Gender medicine*. 2006 Dec 1;3(4):254-69.
 10. MacLennan AH. HRT: a reappraisal of the risks and benefits. *Medical journal of Australia*. 2007 Jun;186(12):643-6.
 11. Gambacciani M, Ciaponi M, Genazzani AR. The HRT misuse and osteoporosis epidemic: a possible future scenario. *Climacteric*. 2007 Jan 1;10(4):273-5.
 12. U.S. Preventive Services Task Force. Hormone therapy for the prevention of chronic conditions in postmenopausal women: recommendations from the U.S. Preventive Services Task Force. *Ann Intern Med*. 2005 May 17;142(10):855–60.
 13. Humphries KH, Gill S. Risks and benefits of hormone replacement therapy: the evidence speaks. *Cmaj*. 2003 Apr 15;168(8):1001-10.
 14. Cauley JA, Robbins J, Chen Z, Cummings SR, Jackson RD, LaCroix AZ, LeBoff M, Lewis CE, McGowan J, Neuner J, Pettinger M. Effects of estrogen plus progestin on risk of fracture and bone mineral density: the Women's Health Initiative randomized trial. *Jama*. 2003 Oct 1;290(13):1729-38.
 15. Reinhardt RA, Payne JB, Maze CA, Patil KD, Gallagher SJ, Mattson JS. Influence of estrogen and osteopenia/osteoporosis on clinical periodontitis in postmenopausal women. *Journal of periodontology*. 1999 Aug;70(8):823-8.
 16. Ronderos M, Jacobs DR, Himes JH, Pihlstrom BL. Associations of periodontal disease with femoral bone mineral density and estrogen replacement therapy: Cross-sectional evaluation of US adults from NHANES III. *Journal of clinical periodontology*. 2000 Oct;27(10):778-86.
 17. Ageel R, Abaalkhail B, Natto ZS. Effect of hormone replacement therapy on periodontal health in postmenopausal women in Jeddah, Saudi Arabia. *BMC Women's Health*. 2025 Aug 2;25(1):383.
 18. Amar S, Chung KM. Influence of hormonal variation on the periodontium in women. *Periodontology 2000*. 1994 Oct;6(1):79-87.
 19. Weinberg MA, Maloney WJ. Periodontal changes in females. *US PHARMACIST*. 2007;32(9):54.
 20. Boyapati R, Cherukuri SA, Bodduru R, Kiranmaye A. Influence of female sex hormones in different stages of women on periodontium. *Journal of mid-life health*. 2021 Oct 1;12(4):263-6.
 21. Sathish AK, Varghese J, Fernandes AJ. The impact of sex hormones on the periodontium during a

- woman's lifetime: a concise-review update. *Current Oral Health Reports*. 2022 Dec;9(4):146-56.
22. Harper-Harrison G, Carlson K, Shanahan MM. Hormone replacement therapy. *InStatPearls [Internet]* 2024 Oct 6. StatPearls Publishing.
23. Koysombat K, McGown P, Nyunt S, Abbara A, Dhillon WS. New advances in menopause symptom management. *Best Practice & Research Clinical Endocrinology & Metabolism*. 2024 Jan 1;38(1):101774.
24. Pizzo G, Guiglia R, Licata ME, Pizzo I, Davis JM, Giuliana G. Effect of hormone replacement therapy (HRT) on periodontal status of postmenopausal women. *Medical science monitor: international medical journal of experimental and clinical research*. 2011 Apr 1;17(4):PH23.
25. Payne JB, Zachs NR, Reinhardt RA, Nummikoski PV, Patil K. The association between estrogen status and alveolar bone density changes in postmenopausal women with a history of periodontitis. *Journal of periodontology*. 1997 Jan;68(1):24-31.
26. Weyant RJ, Pearlstein ME, Churak AP, Forrest K, Famili P, Cauley JA. The association between osteopenia and periodontal attachment loss in older women. *Journal of periodontology*. 1999 Sep;70(9):982-91.
27. Phipps KR, Chan BK, Madden TE, Geurs NC, Reddy MS, Lewis CE, Orwoll ES. Longitudinal study of bone density and periodontal disease in men. *Journal of dental research*. 2007 Nov;86(11):1110-4.
28. Taguchi A, Sanada M, Sueti Y, Ohtsuka M, Nakamoto T, Lee K, Tsuda M, Ohama K, Tanimoto K, Bollen AM. Effect of estrogen use on tooth retention, oral bone height, and oral bone porosity in Japanese postmenopausal women. *Menopause*. 2004 Sep 1;11(5):556-62.
29. Bollen AM, Taguchi A, Hujoel PP, Hollender LG. Number of teeth and residual alveolar ridge height in subjects with a history of self-reported osteoporotic fractures. *Osteoporosis international*. 2004 Dec;15(12):970-4.
30. Tezal M, Wactawski-Wende J, Grossi SG, Ho AW, Dunford R, Genco RJ. The relationship between bone mineral density and periodontitis in postmenopausal women. *Journal of periodontology*. 2000 Sep;71(9):1492-8.
31. Laza GM, Sufaru IG, Martu MA, Anton D, Mocanu R, Pasarin L, Surlin P. The role of hormone replacement therapy in patients with osteoporosis and periodontal disease. *Romanian Journal of Medical and Dental Education*. 2020 Mar;9(2).